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Dichrorampha carpatalpina sp. n. (Lepidoptera, Tortricidae), a high mountain species of the Romanian Carpathians

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Abstract. *Dichrorampha carpatalpina* **sp. n.**, is described from the Southern Carpathians (Romania). It is closely related to *D. inconspiqua* (Danilevsky, 1948) and *D. podoliensis* (Toll, 1942). Adults, male and female genitalia, the habitat of the new species are described and figured and some details of the biology are given. The larva and its host-plant, *Achillea oxyloba schurii* (Sch. Bip.) Heimerl, are illustrated. The species inhabits the north-facing slopes of the highest regions of the Carpathians. During their flight period from the beginning of July to the beginning of August the moths are on wing in the morning and only in sunny weather.

Introduction

In the last few years important progress has been made in the knowledge of the high mountain *Dichrorampha* fauna of the Balkan Peninsula. A study of recently collected and historical material clarified the taxonomic status of *D. rilana* Drenowsky, 1909 and described *D. dinarica* Huemer, Zlatkov & Baixeras, 2012, a century-long misidentified species (Huemer et al. 2012). The previously unknown female of *D. rilana* was also described (Zlatkov 2013). At the same time *D. inconspiqua* (Danilevsky, 1948) was identified as new to the European fauna (Zlatkov and Budashkin 2010; Trematerra and Colacci 2017) and *D. pentheriana* (Rebel, 1917), a species previously known only from its type locality in Montenegro, was recorded from Bulgaria (Zlatkov 2016).

In the present paper we increase the knowledge of the high mountain *Dichrorampha* fauna of the Balkan Peninsula by describing a new species discovered in the subalpine and alpine regions of the Southern Carpathians, the high mountain chain forming the border between Central Europe and the Balkan Peninsula. The first males were collected nearly three decades ago, in 1989 in the Bucegi Mountains. In 1994 it was also discovered in the Făgăraş Mountains, when our first attempt to identify the species was unsuccessful because it was not in Kuznetsov (1978). The suspicion that it was an undescribed species arose when the second volume of the Tortricidae of Europe (Razowski 2003), including the genus *Dichrorampha*, was published. Our efforts to collect additional material were moderately successful initially, but consistent and persistent searches in the last few years resulted in numerous specimens being collected, and the discovery of the female, host-plant, larva and new sites. The specimens differ both externally and in the male and female genitalia from the known species of *Dichrorampha*, and are described below as a new species.

Material and methods

The examined material is dried, pinned and set. The genitalia preparation technique used by the authors is a simplified variant of the usual method, with unmounted preparations being stored in glycerine tubes. Only the preparation of genitalia slides that were made to be photographed followed standardized techniques (Robinson 1976). Photographs of the adults, larvae, host-plant and habitat were taken using Sony DSC–H2 and Sony DSC–W830 digital cameras. Photographs of the genitalia were taken using an Olympus SZX16 microscope with a motorized focus drive attached to an Olympus E520 digital camera. Images have been edited in ADOBE Photoshop.

Abbreviations

TLMF Tiroler Landesmuseum Ferdinandeum, Innsbruck, Austria;

ZMUC Zoological Museum, Natural History Museum of Denmark, Copenhagen, Denmark.

Results

Dichrorampha carpatalpina sp. n.

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Figs 1–8, 12

Holotype. ♂. [România] Carpaţii Meridionali, Munţii Făgăraş, Căldarea Bâlea, 2100–2200 m, 14.vii.2016, legit & coll. S. & Z. Kovács (Miercurea Ciuc).

Paratypes. 112 ♂♂, 9 ♀♀, all collected by S. & Z. Kovács and if not otherwise mentioned are deposited in the authors' collection. [România, Carpaţii Meridionali, Munţii] Bucegi, Valea Jepilor, 1600 m, 8.vii.1989 (2 ♂♂); Idem, but 1900 m, 1.viii.1990 (♂); [România, Carpaţii Meridionali, Munţii] Bucegi, Caraiman, 2100 m, 1.viii.1990 (♂); Idem, but 2300 m, 22.vii.2006 (♂), genit. prep. no. 1731/♂/ Kovács (2015); Idem, but 2380 m, 9.vii.2013 (♂); Idem, but 2300 m, 8.vii.2015 (2 ♂♂); [România] Carpaţii Meridionali, Munţii Făgăraş, V[âr]f[ul]. Paltinu, 2350 m, 29.vii.1994 (3 ♂♂), genit. prep. no. 675/♂/ Kovács (1994); Idem, but 2400 m, 24.vii.2006 (♂); Idem, but 2200 m, 10.vii.2013 (5 ♂♂), 1 ♂ and slide no. 5288/♂/ O. Karsholt (2015), coll. ZMUC; Idem, but 2300 m, 10.vii.2013 (2 ♂♂); Idem, but 2300 m, 21.vii.2015 (3 ♂♂); Idem, but 2300 m, 14.vii.2016 (4 ♂♂); [România] Carpaţii Meridionali, Munţii Făgăraş, Căldarea Bâlea, 2100 m, 10.vii.2013 (♀), slide no. 5289/♀/ O. Karsholt (2015), coll. ZMUC; Idem, but 2100–2200 m, 21.vii.2015 (30 ♂♂, 2 ♀♀), genit. prep. no. 1732/♂/ Kovács (2015); Idem, but 2100–2200 m, 14.vii.2016 (9 ♂♂), 2 ♂♂ coll. TLMF; Idem, but 2100–2200 m, 18.vii.2016. ex pupa ([from samples of] *Achillea oxyloba* subsp. *schurii* (Sch. Bip.) Heimerl [with a shallow layer of soil] 14.vii.2016) (♂); Idem, but 2100–2200 m, 20.vii.2016 ex pupa ([from samples of] *Achillea oxyloba* subsp. *schurii* (Sch. Bip.) Heimerl [with a shallow layer of soil] 14.vii.2016) (2 ♀♀); Idem, but 2100–2200 m, 22.vii.2016 ex pupa ([from samples of] *Achillea oxyloba* subsp. *schurii* (Sch. Bip.) Heimerl [with a shallow layer of soil] 14.vii.2016) (♀); [România] Carpaţii Meridionali, Munţii Făgăraş, V[âr]f[ul]. Vânătoarea lui Buteanu, 2400–2500 m, 22.vii.2015 (18 ♂♂, 1 ♀), genit. prep. no. 1733/♂/ and 1735/♀/ Kovács (2015); [România] Carpaţii Meridionali, Munţii Făgăraş, Vârful Văiuga, 2300–2400 m, 22.vii.2015 (9 ♂♂); [România] Carpaţii Meridionali, [Munţii] Piatra Craiului, Brâna Caprelor, 1700 m, 9.vii.2015 (♂); Idem, but 1800 m, 23.vii.2015 (♂); [România] Carpaţii Meridionali, [Munţii] Piatra Craiului, Vârful Padina Popii, 2000 m, 9.vii.2015 (11 ♂♂, 1 ♀); Idem, but 23.vii.2015 (6 ♂♂, 1 ♀), genit. prep. no. 1734/♂/ Kovács (2015).

Figure 1. *Dichrorampha carpatalpina* sp. n., male, holotype, wingspan: 15.5 mm, Făgăraş Mountains, Căldarea Bâlea, 2100–2200 m, 14.vii.2016, photograph Z. Csata.

Figure 2. *Dichrorampha carpatalpina* sp. n., male, paratype, wingspan: 13.5 mm, same data as holotype, photograph Z. Csata.

Figure 3. *Dichrorampha carpatalpina* sp. n., female, paratype, wingspan: 13 mm, Făgăraş Mountains, Căldarea Bâlea, 2200 m, ex pupa, 20.vii.2016, photograph Z. Csata.

Description. Male (Figs 1–2). Head. Frons and vertex covered with brown scales. Ocellus present. Proboscis developed. Labial palpus about 2.5 times length of diameter of eye. First segment short, covered with short brown scales, second segment long, covered with long brown scales forming large trapezoidal brush, with pale yellow scales on central part of lateral surface. Segment 3 short and almost fully hidden by scalebrush of segment 2. Antennae filiform, brown.

Thorax. Dorsally covered with brown scales, similar to tegulae and ground colour of forewing. Wingspan of holotype 15.5 mm. Forewing with costal fold to about 1/3 of length of costa, apex slightly pointed, but with fringes appearing rounded. Brown ground colour of forewing extended at base and along dorsal margin. On distal 2/3 along costa brown ground colour mottled due to some mixed yellow scales. In subterminal, terminal and apical areas most brown scales replaced by yellow ones, remaining brown scales forming small patches along costa and few ill-defined, narrow and fragmented transverse lines. Large triangular dorsal patch greyish brown, mixed distally with small groups of yellow scales, and dorsally with brown scales. All other forewing markings which usually characterize species of the genus *Dichrorampha* namely costal strigulae, interspaces, metallic plumbeous striae and row of black dots along termen absent. Fringes light brown with brown basal line. Hindwing brown, fringes light brown with well defined brown basal line. Underside of thorax, wings and legs iridescent greyish brown.

Abdomen dorsally covered with brown scales, ventrally iridescent greyish brown. Male genitalia (Fig. 4). Uncus a small rounded apical prominence on arched tegumen. Gnathos weak, ribbon-like. Valva broad, basal cavity wide. Long sacculus rather straight and parallel with costa. Conspicuous caudal angle of sacculus nearly rectangular, ventral emargination deep and neck of valva short. Large and slightly pointed cucullus with broad ventral corner, distally covered with numerous long setae and short spiniform setae at ventro-distal edge. Juxta sub-triangular, anellus

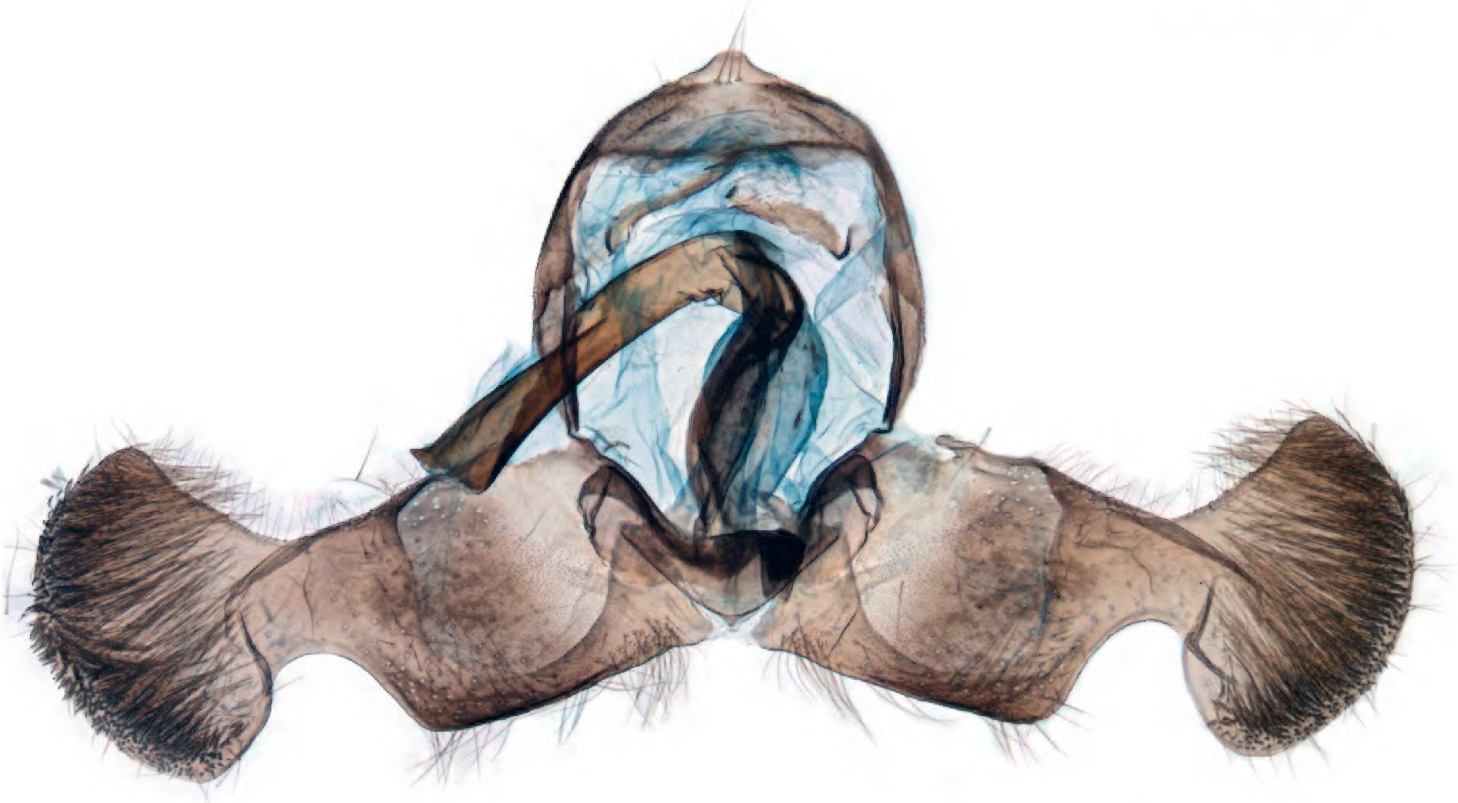
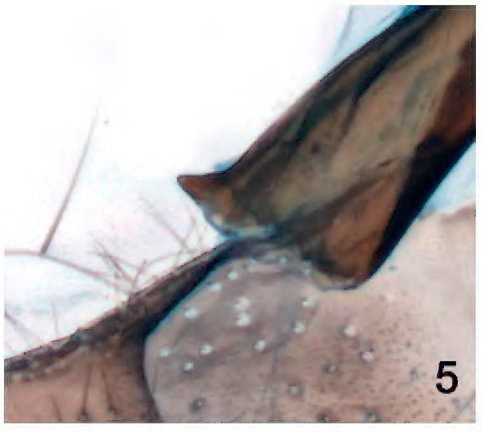
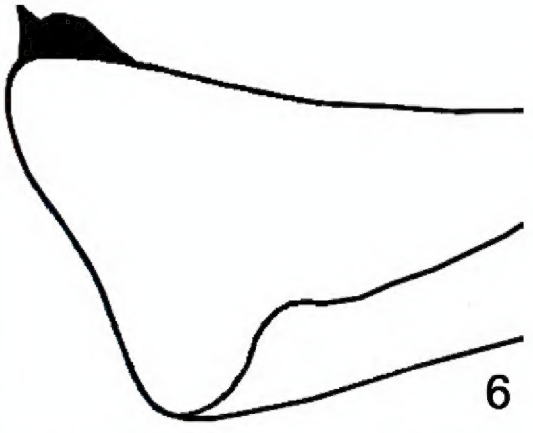
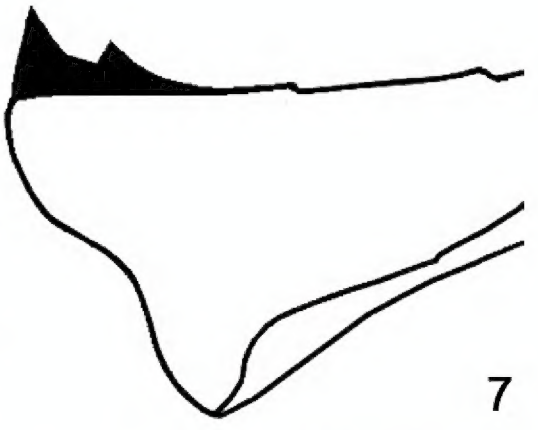


Figure 4. *Dichrorampha carpatalpina* sp. n., male genitalia, paratype, Făgăraş Mountains, slide 5288 and photograph O. Karsholt.







Figures 5–7. *Dichrorampha carpatalpina* sp. n., male genitalia, paratypes, variation of end of phallus. **5.** Prep. genit. no. 5288, Făgăraş Mountains; **6.** Prep. genit. no. 1734, Piatra Craiului Mountains; **7.** Prep. genit. no. 1731, Bucegi Mountains.

without lobes. Phallus curved ventrally, moderately long, about 2/3 length of valva, without cornuti, distal half with large dorsal slit. Widened end of phallus with single triangular lateral tooth.

Variation. The wingspan varies between 12 and 16.5 mm, the colour of the yellow scales varies from yellowish grey to golden. The dorsal patch may be divided by one or two weak, brown, fragmented transverse lines. In worn specimens the mottling and dorsal patch become almost indistinguishable and so these moths look more or less uniformly brown. Male genitalia show small variation (n = 6) in the size and shape of the lateral tooth at the end of the phallus (Figs 5–6); one specimen has a small second tooth (Fig. 7).

Female (Fig. 3). Antennae narrower and shorter than male's. Forewing slightly broader at base, wingspan 13–15 mm. Brown ground colour more extensive, with fewer yellow scales in terminal

and apical areas compared with male. Female genitalia (Fig. 8). Papillae anales relatively large, apophyses anteriores almost twice as long as apophyses posteriores. Sterigma fused with seventh abdominal sternite, trapezoidal, with concave posterior margin, weakly convex lateral edges and almost straight anterior margin. Posterior part of ductus bursae forming large, strongly sclerotized tubular antrum, with its narrower anterior part not reaching anterior margin of seventh abdominal sternite. Anterior part of ductus bursae membranous, narrow, with distinct convex sclerite. Corpus bursae small, single signum a small rounded plate with a hook.

Diagnosis. The new species has the characters of the genus *Dichrorampha*: shape of wings, developed costal fold in male, reduction of vestiture of valva, neck of valva and caudal angle of sacculus clearly separate, distinct cucullus, phallus with large dorsal slit, sterigma fused with distal edge of seventh abdominal sternite, distinct convex sclerite of ductus bursae, and reduction to one signum (Razowski 2003).

Dichrorampha carpatalpina is unmistakable owing to its dominant brown colour and complete lack of most of the usual forewing pattern elements (strigulae, interspaces, metallic plumbeous striae, and row of black dots along termen). Only a faint greyish brown dorsal patch and the yellow mottled terminal and apical areas interrupt the uniform brown colour of the forewing. The male genitalia are also distinct. The long sacculus with nearly rectangular caudal angle, the robust cucullus, and the phallus widened terminally with 1(–2) lateral teeth are the main diagnostic features. The female genitalia are characterized by an evenly sclerotized antrum, which is shorter than the length of the seventh abdominal sternite, and a small corpus bursae.

Similar species. The genitalia resemble those of the species of the "section gruneriana" (Danilevsky and Kuznetsov 1968). Males of *Dichrorampha gruneriana* (Herrich-Schäffer, 1851), *D. melaniana* Nel & Varenne, 2016 and *D. infuscata* (Danilevsky, 1960) have a shorter sacculus, a longer neck of the valva, and a narrower ventral corner of the cucullus than *D. carpatalpina*. The poorly known *D. inconspiqua* is the most closely related species having a similarly shaped valva, but the longer and more pointed ventral corner of the cucullus and the phallus with a row of 5–6 terminal thorns clearly separate it from the newly described species. The valva of *D. podoliensis* (Toll, 1942) also has similar structure, but the phallus, which is considerably longer and bears a terminal row of small thorns, is strikingly different. The other members of the species-group, *D. nigrobrunneana* (Toll, 1942), *D. alpigenana* (Heinemann, 1863) and *D. tarmanni* Huemer, 2009 all have a shorter sacculus with a rounded caudal angle and a claw-like curved ventral corner of the cucullus. The antrum of the female of *D. carpatalpina* is shorter than the length of the seventh abdominal sternite, unlike in *D. nigrobrunneana*, *D. inconspiqua*, *D. alpigenana* and *D. melaniana*, in which the antrum is longer than the seventh abdominal sternite. The antrum of *D. tarmanni* is as long as that of the new species, but has a strong lateral fold and the shape of the seventh abdominal sternite also differs. *D. gruneriana* and *D. infuscata* possess a shorter antrum than the newly described species. The antrum of *D. podoliensis* has strong lateral folds, the ductus bursae is longer and the corpus bursae is larger than that of *D. carpatalpina* (Danilevsky and Kuznetsov 1968; Razowski 2003; Huemer 2009; Lepiforum 2016; Nel and Varenne 2016; Varenne and Nel 2017).

Systematic position. In view of the genitalia structure of both sexes, *Dichrorampha carpatalpina* should be placed near *D. inconspiqua* and their close relative *D. podoliensis*.

Habitat. *Dichrorampha carpatalpina* inhabits the highest mountains in the Romanian Carpathians. The moths are most abundant in the alpine zone from 2000 to 2500 m above sea level. Isolated

Figure 8. *Dichrorampha carpatalpina* sp. n., female genitalia, paratype, Făgăraş Mountains, slide 5289 and photograph O. Karsholt.

specimens were also observed in the subalpine zone between 1600 and 1900 m (5 males). The substrate is conglomerate in Bucegi, silicate in Făgăraş (Fig. 9) and limestone in Piatra Craiului Mountains (Fig. 10). The species prefers north-facing slopes with different inclinations, covered with sparse alpine vegetation (Fig. 11).

Phenology. Univoltine, adults are on the wing from the beginning of July to the beginning of August, highly depending on elevation, exposure of the sites and general weather conditions.

Figure 9. The habitat of *Dichrorampha carpatalpina* sp. n., Făgăraş Mountains, general view of north-facing slopes at 2200–2500 m, eastwards of Vânătoarea lui Buteanu Peak (north on left hand side).

Figure 10. The habitat of *Dichrorampha carpatalpina* sp. n., Piatra Craiului Mountains, north-west facing slopes at 2000–2100 m around Padina Popii Peak.

Figure 11. The habitat of *Dichrorampha carpatalpina* sp. n., Făgăraş Mountains, north-facing slope, Căldarea Bâlea, 2200 m.

At lower elevations, on north-east or north-west facing slopes they emerge earlier, from the beginning of July to mid July. At higher elevations and on north-facing sites adults emerge later, starting from mid July.

Biology. The early stages are still poorly known. Eggs are unknown. Larvae are yellowish white with a brown head (Fig. 12). They live in the soil, usually several individuals feeding on the roots of the host-plant. The latter, *Achillea oxyloba* (DC.) (Sch. Bip.) subsp. *schurii* (Sch. Bip.) Heimerl (Sârbu et al. 2013) (Fig. 13), was always common at the collecting sites. The place of pupation is unknown, but moths emerged within a few days of collecting samples of the host-plant with a shallow layer of soil. Pupation probably takes place in the spring after hibernation. Adults emerge in the morning, males a few days earlier than females. After the emergence of adults several different-sized larvae were found between the roots of the host-plant, which indicates that they hibernate more than once (a well-known life strategy in alpine Lepidoptera).

The moths fly only in sunshine as in cloudy weather we did not observe any kind of activity. In the morning, when north-facing slopes become sunny, males start to search for females. Their flight is not very fast, 10–20 cm above the ground, following a sinuous route, interrupted from time to time by short stops of only a few seconds on the dewy vegetation. Once disturbed their flight becomes faster and after 5–15 m they suddenly hide within the vegetation. During the afternoon the moths do not fly freely although in sunny weather they can be easily disturbed.

Females are less active than males. They rest on the vegetation and when disturbed they fly only a few metres before hiding again in the vegetation or between rocks. All the female specimens were collected during the morning or obtained from pupae. They were much rarer than males, the ratio

Figure 12. The larvae of *Dichrorampha carpatalpina* sp. n., 27.vii.2016, in laboratory (larvae collected: Făgăraş Mountains, Căldarea Bâlea, 2200 m, 14.vii.2016).

Figure 13. *Achillea oxyloba schurii* (Sch. Bip.) Heimerl, the host-plant of *Dichrorampha carpatalpina* sp. n., Făgăraş Mountains, Căldarea Bâlea, 2200 m.

being 1 female to 12 males collected. One morning a pair in copula was observed sitting on the low vegetation. Their mating was soon disturbed by other attracted males. *Dichrorampha carpatalpina* does not seem to be active by night as none was collected by light traps installed at sites where several specimens were observed during the same day.

Distribution. *Dichrorampha carpatalpina* seems to be widespread and locally common in the three main mountain ranges in the easten half of the Southern Carpathians: Bucegi, Făgăraş and Piatra Craiului. It may also occur in the western part, at least in the very similar Retezat and Parâng Mountains, where we made only one unsuccesful attempt to find it. The large distribution range of the host-plant, *Achillea oxyloba schurii*, along the whole Eastern and Southern Carpathians (Oprea 2005; Kliment et al. 2016) also suggests a wider distribution.

Etymology. The name „*carpatalpina*" alludes to the alpine range of the Southern Carpathians where the new *Dichrorampha* species was discovered. The epithet is used as an adjective.

Acknowledgments

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